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STRATIGRAPHIC POSITION OF WESTERN RED-BEDS.

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In Iowa some very important parts of the general Carbonic section are missing. Of these unrepresented portions none is so widely interesting at the present time as the part commonly called the Red-Beds. The very name is itself indicative of the uncertainties surrounding the proper geologic affinities of the formation. Until very recently the Red-Beds formation has been one of the enigmas of American geology. The Red-Beds have steadily resisted all attempts to unravel the secret of their geologic age. The key to the puzzle appears finally to be found in the far-off Mexican tableland.

If the doubtful Fort Dodge gypsum beds are excepted, and special attention will be directed to them later, the nearest localities to Iowa where undoubted Red-Beds are definitely known to occur are in central Nebraska and Kansas. In the last mentioned state no mention has ever been made of any evidence suggesting that the Red-Beds follow the other Carbonic strata in any other than strictly unbroken sequence. In the southern Rocky Mountain region and in the northern part of the Mexican tableland, in eastern New Mexico, the beds in question have been found of late to have unconformable relationships with the other Carbonic beds beneath.[1]

The geologic age of the Kansas Red-Beds has long been a matter of controversy. By some authors they were considered as all of Permian age; by others all of Triassic age. But in New Mexico, quite recently, it has been discovered that the lower part of the Red-Beds section is really Late Carbonic (Oklahoman series) in age; while the upper part is of Triassic age; and that the two divisions are separated by a well-marked unconformity.[2] It has been also found in the New Mexican region that there are other extensive Red-Beds which belong neither to the Carbonic nor the Triassic ages, but to the Devonian, Cretacic, and even Tertiary ages.[3]

The so-called Permian[4] Red-Beds of Kansas are now called the Cimarronian series.[5] In Nebraska, Kansas, Oklahoma and Texas this great series immediately follows, without as yet recognized unconformity, as has been stated, the Oklahoman series, which succeeds the Missourian series, so well represented in southwestern Iowa and northwestern Missouri by our Upper Coal Measures. Far to the southwest, in southern New Mexico, in a lofty range known as the Guadalupe mountains, there lies above a great section of blue limestone which

1. Am. Jour. Sci. (4), Vol. XXI, p. 296, 1906.
2. Am. Jour. Sci. (4), Vol. XX, p. 425, 1905.
3. Journal of Geology, Vol. XVI, p. 445, 1908.
4. Journal of Geology, Vol. VII, p. 321, 1899.
5. Colorado College Studies, Vol. VI, p. 3, 1896.

is correlated with the Oklahoman series of Kansas, a sequence, over 3500 feet in thickness, of sandstones and limestones, which carry the only organic forms known from this country representing the original Permian faunas of eastern Russia.[6]

As at present understood the Red-Beds, which succeed the thick Guadalupan series on the backslope of the tilted block forming the Guadalupe mountains, are the true southern extension of the Cimarronian Red-Beds, that a little farther to the eastward, in the Pecos valley, are followed by Triassic Red-Beds. If this interpretation of the stratigraphy of the southern New Mexico region be correct then the entire Guadalupan series, representing at least 3500 feet of strata, are missing in the central Kansas section, and there are probably unconformable relationships existing between the Cimarronian and Oklahoman series of that section.

In central Kansas no one, so far as I am aware, has ever before intimated that the Cimarronian series rest unconformably upon the Oklahoman series. At best it would be in that region very difficult to make out such relationships. Passing now to north-central Iowa it is possible that we have a clew to the true situation in the isolated area of the Fort Dodge gypsum deposits. If the gypsiferous beds of Fort Dodge are really Late Carbonic in age instead of Cretacic age, as Wilder[7] has recently attempted to show, we have right here in Iowa unexpected data for the solution of the Red-Beds problem. It has been shown[1] however, that Wilder's argument for considering the Fort Dodge gypsum deposits earlier than Cretacic in age is not supported by adequate facts derived from his observations on the region, that there are general stratigraphic considerations which he did not touch upon that make the suggestion more worthy of special and exact inquiry than any which he has discussed. It must also be remembered that the gypsiferous beds at Fort Dodge are not Red-Beds in any sense of the word, nor does their slight pinkish tinge at all suggest the true Red-Beds of Kansas.

Of the other great "Red-Beds" formations of the southern Rocky Mountain region special mention should be made of the Bernalillo shales,[2] nearly 1000 feet in thickness, which immediately overlie in the typical locality in the Sandia mountains the dark blue and black limestones. These shales carry abundant fossils which correspond faunally with those found in the upper part of the Oklahoman series of Kansas. Besides these Red-Beds there have been recognized in the region other great red colored terranes in the Cretacic section, in the Tertiary section and in the Devonic section, as already stated.

6. Journal of Geology, Vol. XIV, p. 296, 1906.
7. Iowa Geol. Surv., Vol. XII, p. 63, 1901.
1. American Geologist, Vol. XXX, p. 99, 1902.
2. Rept. of Governor of New Mexico to Secretary of the Interior, for 1903, p. 339, 1904.